

RESULTS FOR THE DETERMINATION OF PERMEATION RATES FROM LOW DENSITY POLYETHYLENE CONTAINERS

June 7, 2000

Introduction

The Air Resources Board (ARB) staff tested several Low-Density Polyethylene (LDPE) portable fuel containers (containers) to determine average permeation rates. Scribner Engineering submitted several five-gallon containers to the ARB staff for evaluation. Tests were performed in duplicate on five-gallon containers rotationally molded using a variety of different polyethylene resins. Containers were preconditioned with commercial fuel, refilled with CERT fuel, and subjected to a variable temperature profile. Permeation rates were then determined gravimetrically.

Test Protocol

Scribner Engineering submitted eight containers (see Attachment 1-Packing Slip) in late July and ARB staff filled them with commercial fuel for preconditioning. All containers began the preconditioning by August 2, 1999. During the preconditioning cycle containers were stored at ambient temperature and pressure in flammable storage cabinets. After 12 weeks of ambient preconditioning, the containers were emptied, blown dry with compressed zero air, and immediately refilled with CERT fuel. The containers were then sealed using a hand held fusion welder and 1/4" thick HDPE coupons and leak tested as specified in proposed ARB Test Method 513 (copy can be found at ARB web site: <http://www.arb.ca.gov/regact/spillcon/spillcon.htm>).

Weight loss was used as the basis for determining relative permeation rates. Sealed containers were weighed using a high capacity balance with a sensitivity of ± 0.01 grams prior to the start of each diurnal cycle. After each container was weighed and the weight recorded, they were placed in Sealed Housing for Evaporative Determination (SHED) and exposed to a 1-day/24-hour/1440-minute variable temperature profile (see Attachment 2). Containers were then post weighed after each 24-hour diurnal cycle and the weight loss calculated.

Cumulative weight loss were determined for each containers as a function of time. The first three days of test data were not used in determining individual per container permeation rates due to high variability.

Results

The average permeation rate from containers designated as 6220 K (Attachment 1) was determined to be 0.99 grams/gallon/day. This rate is based on data

averaged from tests of two individual containers and represents a total of 40 individual 24-hour diurnal cycles.


The average permeation rate from containers designated as 6220 R was determined to be 0.73 grams/gallon/day. This rate is based on data averaged from tests of two individual containers and represents a total of 40 individual 24-hour diurnal cycles.

The average permeation rate from containers designated as 6220 B was determined to be 0.85 grams/gallon/day. This rate is based on data averaged from tests of two individual containers and represents a total of 40 individual 24-hour diurnal cycles.

The average permeation rate from containers designated as 6220 W was determined to be 0.89 grams/gallon/day. This rate is based on data averaged from tests of two individual containers and represents a total of 40 individual 24-hour diurnal cycles.

A summary of all test results can be found in Attachment 3.

Attachment 1 – Packing Slip

PACKING LIST/DELIVERY RECEIPT					
		Resale # SRKH25-766564 Tax ID # 68-0066585 2403-B Mercantile Dr. Rancho Cordova, CA 95742 (916) 638-1515		<input checked="" type="checkbox"/> PACKING LIST <input type="checkbox"/> DELIVERY RECEIPT	10515
		SHIP TO: CALIF. AIR RESOURCES BOARD		SOLD TO:	
CUSTOMER ORDER NO.	DATE SHIPPED	SHIPPED VIA	OUR NO.	SALESPERSON	
	7-26-99	W/C			
QTY	QUANTITY	ITEM NO.	DESCRIPTION		
	2		SPOUTS (RETURNED)		
	2	6220	K		
	2	6220	R	No	
	2	6220	B	CHARGE	
	2	6220	W		
CARTONS	TOTAL WEIGHT	ORDER COMPLETE	BALANCE TO FOLLOW	PACKED BY	CHECKED BY
RECEIVED IN GOOD ORDER BY: <i>[Signature]</i>					
PLEASE NOTIFY US IMMEDIATELY IF ERROR IS FOUND IN SHIPMENT					

Attachment 2

1 Day / 24 Hour / 1440 Minute Variable Temperature Profile

HOUR	MINUTE	ET / MIN	TEMP °F
0	0	1440	65.0
1	60	1380	66.6
2	120	1320	72.6
3	180	1260	80.3
4	240	1200	86.1
5	300	1140	90.6
6	360	1080	94.6
7	420	1020	98.1
8	480	960	101.2
9	540	900	103.4
10	600	840	104.9
11	660	780	105.0
12	720	720	104.2
13	780	660	101.1
14	840	600	95.3
15	900	540	88.8
16	960	480	84.4
17	1020	420	80.8
18	1080	360	77.8
19	1140	300	75.3
20	1200	240	72.0
21	1260	180	70.0
22	1320	120	68.2
23	1380	60	66.5
24	1440	0	65.0

Attachment 3 - Permeation Test Results

6220 K

Diurnal Cycles (# 24 hr cycles)	Can Identification	Can Mfg.	Can Volume (gallons)	Test Dates	Fuel Type	Avg. Loss (g/gal/day)
20	6220 K1	Scribner	5	10/22-11/14	CERT	0.99
20	6220 K2	Scribner	5	10/22-11/14	CERT	0.98
Average						0.99

6220-R

Diurnal Cycles (# 24 hr cycles)	Can Identification	Can Mfg.	Can Volume (gallons)	Test Dates	Fuel Type	Avg. Loss (g/gal/day)
20	6220 R1	Scribner	5	10/22-11/14	CERT	0.73
20	6220 R2	Scribner	5	10/22-11/14	CERT	0.73
Average						0.73

6220 B

Diurnal Cycles (# 24 hr cycles)	Can Identification	Can Mfg.	Can Volume (gallons)	Test Dates	Fuel Type	Avg. Loss (g/gal/day)
20	6220 B1	Scribner	5	10/22-11/14	CERT	0.83
20	6220 B2	Scribner	5	10/22-11/14	CERT	0.87
Average						0.85

6220 W

Diurnal Cycles (# 24 hr cycles)	Can Identification	Can Mfg.	Can Volume (gallons)	Test Dates	Fuel Type	Avg. Loss (g/gal/day)
20	6220 W1	Scribner	5	10/22-11/14	CERT	0.84
20	6220 W2	Scribner	5	10/22-11/14	CERT	0.94
Average						0.89